

DOCUMENT RESUME

ED 185 680

EA 012 614

AUTHOR Sharples, Brian
TITLE An Analysis of Major Determinants of Teacher Salaries and Their Implications for Educational Expenditures.
SPONS AGENCY Ontario Dept. of Education, Toronto.
PUB DATE 78
NOTE 84p.
EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Elementary Secondary Education; *Expenditure Per Student; *Instructional Student Costs; Literature Reviews; Statistical Studies; Tables (Data); *Teacher Salaries
IDENTIFIERS *Ontario

ABSTRACT

The purposes of this study were to compare the responsiveness of educational expenditures per pupil in Ontario, first, to changes in instructional expenditures per pupil during 1971-77, and, second, to changes in proxy measures of educational quality and price levels of teacher services for 1974-77. Variables used to represent quality and price levels were academic qualifications, years of teaching experience, pupil teacher ratio, and beginning salaries. Data for the analysis were obtained from Ontario Ministry of Education reports. The paper concludes that, on the average, instructional expenditures per pupil have been more responsive to changes in educational quality than to changes in the price level of teacher services. In addition, teachers' salaries in recent years have declined somewhat in comparison to salaries of all other employees in Ontario. (Author/LD)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED185680

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

AN ANALYSIS OF MAJOR DETERMINANTS OF
TEACHER SALARIES AND THEIR IMPLICATIONS
FOR EDUCATIONAL EXPENDITURES

Brian Sharples, Principal Researcher
Faculty of Education
Queen's University
Kingston

This research project was funded
under the Grants-in-Aid of
Educational Research and Development
Program by the Ministry of Education,
Ontario

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY

B. Sharples

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)."

EA 012 614

ABSTRACT

The purpose of this study was to examine and analyse (1) the responsiveness of educational expenditures per pupil to changes in instructional expenditures per pupil during the years 1971-77; (2) the responsiveness of instructional expenditures per pupil to changes in proxy measures of educational quality and price levels of teacher services for the years 1974-77. The variables used to represent quality and price levels were academic qualifications, years of teaching experience, pupil teacher ratio and beginning salaries. Data for the analysis was obtained from Ontario Ministry of Education reports.

The basis for the analysis of this data was the economic concept of elasticity which describes by means of a coefficient the relative change of a dependent variable compared to the corresponding change of associated independent variables. Elasticity coefficients were derived by means of stepwise multiple regression analysis. The derived coefficients represented an average which summarized the changes in the variable concerned.

The effect of changes in instructional expenditures per pupil on educational expenditures per pupil varied among the school types and from year to year. However, average elasticities approached unity for the overall time period. A similar situation existed when comparisons of elasticities were based upon levels of financial support provided by the provincial government.

The instructional expenditure elasticities derived in the study revealed no consistent pattern of coefficients. However, the most significant factor in changing instructional expenditures is the pupil teacher ratio. In the case of school systems receiving a high level of provincial support it would appear that instructional expenditures are particularly responsive to changes in years of teaching experience and academic qualifications. In the case of the more wealthy school systems such expenditures are more responsive to beginning salaries and pupil teacher ratios.

A general observation to be derived from the study is that, on the average, instructional expenditures per pupil have been more responsive to changes in educational quality than to changes in the price level of teacher services. Furthermore, it is suggested that in recent years teachers salaries relative to those of all employees in Ontario has declined somewhat.

To conclude the study, a method of fiscal planning is suggested by which the elasticities derived in the study were used to assess the future impact of changes in educational quality and price levels of teacher services on instructional expenditures per pupil. It would appear that their impact will be limited.

TABLE OF CONTENTS

	PAGE
LIST OF TABLES.....	iv
CHAPTER	1
I. STATEMENT OF THE PROBLEM.....	1
INTRODUCTION.....	1
THE CONCEPT OF ELASTICITY.....	4
STATEMENT OF THE PROBLEM.....	5
LIMITATIONS OF THE STUDY.....	6
II. REVIEW OF RELATED LITERATURE.....	8
III. THE RESEARCH DESIGN.....	16
INTRODUCTION.....	16
REQUIRED VARIABLES.....	16
Instructional Expenditures.....	17
Teaching Experience.....	18
Academic Qualifications.....	18
Pupil Teacher Ratio.....	19
Beginning Salary.....	19
COLLECTION OF DATA.....	20
TREATMENT OF DATA.....	20
The Elasticity Coefficient.....	21
IV. ELASTICITIES OF EDUCATIONAL AND INSTRUCTIONAL EXPENDITURES.....	25
MEASURES OF EDUCATIONAL AND INSTRUCTIONAL EXPENDITURES.....	25
INTERPRETATION OF ELASTICITIES.....	27
ELASTICITY OF EDUCATIONAL EXPENDITURES: FINDINGS...	28
MEANS AND STANDARD DEVIATION OF INDEPENDENT VARIABLES.....	34

ELASTICITY COEFFICIENTS OF INSTRUCTIONAL.....	38
V. IMPLICATIONS OF THE FINDINGS.....	46
USE OF ELASTICITIES.....	46
INTERPRETATION OF THE ELASTICITIES.....	48
EFFECTS OF LEVELS OF SUPPORT.....	53
SALARIES OF TEACHERS AND OTHER OCCUPATIONS.....	56
VI. OUTLOOK FOR PUBLIC SCHOOL FINANCE.....	59
INTRODUCTION.....	59
ASSUMPTIONS.....	59
FUTURE EXPENDITURES.....	63
IMPLICATIONS FOR INSTRUCTIONAL.....	66
Expenditures Per Pupil.....	66
VII. SUMMARY AND CONCLUSIONS.....	69
INTRODUCTION.....	69
MAJOR FINDINGS.....	70
Educational Expenditures.....	70
Instructional Expenditures.....	71
Implications for the Future.....	73

LIST OF TABLES

TABLE	PAGE
I. Provincial Means and Standard Deviations of Expenditures by Year and Type of Board, 1974-77....	26
II. Elasticity Coefficients of Educational Expenditures by Year and Type of School, 1971-77.....	30
III. Average Elasticity Coefficients of Educational Expenditures by Type of School for the Period 1971-77.....	32
IV. Elasticity Coefficients of Educational Expenditures by Year, Type of School and Level of Provincial Support, 1971-77.....	33
V. Average Elasticity Coefficients of Educational Expenditures by Type of School and Level of Provincial Support, 1971-77.....	35
VI. Provincial Means and Standard Deviations of Variables under Consideration by Year and Type of School, 1974-77.....	37
VII. Elasticity Coefficients of Instructional Expenditures by Year and Type of School, 1974-77.....	39
VIII. Average Elasticity Coefficients of Instructional Expenditures by Type of School for the Period 1974-77.....	42
IX. Elasticity Coefficients of Instructional Expenditures by Year, Type of School and Level of Provincial Support, 1974-77.....	43
X. Average Elasticity Coefficients of Instructional Expenditures by Type of School and Level of Provincial Support for the Period 1974-77.....	45
XI. Median Salaries of School Teachers as Percentage of All Employees Average Income, Ontario, 1945 to 1975.....	57
XII. Projected Annual Rates of Change for the Years 1978-88.....	61
XIII. Indices of Instructional Expenditures per Pupil for a Ten Year Period by Type of School, 1978.....	65

CHAPTER 1*

STATEMENT OF THE PROBLEM

1. INTRODUCTION

At this point in time education is entering a period of restrictive economic conditions. Not only are sincere attempts being made to reduce the overall growth of educational expenditures but efforts are being made to resist an imbalance among the various educational inputs for which expenditures are made. A particular example of the latter point is a recent memorandum regarding the provision of texts and learning resources in which Mr. R.A.L. Thomas, Assistant Deputy Minister of Education states:

"There have been indications in recent years that the proportion of the operating budget allocated to textbooks, library resources, and other educational media has decreased. In view of the central importance of learning materials in the educational process, such reduced allocations would appear to be unwise. School boards are therefore strongly urged to make adequate provision in school operating budgets for the acquisition of textbooks, library resources, and other learning materials so that the curriculum needs of students may be fully met."

The implication of this statement is that other budgetary allocations are increasing and thereby depriving students of a full range of educational resources.

Since the nineteen-sixties education has witnessed almost dramatic increases in teacher salaries. So much so, that it is commonly assumed that the major portion of the increase in educa-

*This study was made possible by funds provided through the Grants-in-Aid of Educational Research and Development Program of the Ontario Ministry of Education, 1977.

tional expenditures is absorbed by teacher salaries. In fact, Simon² has suggested that additional money for education goes directly from the pockets of the tax payer to those of the teacher with very little effect on the educational process.

A rather superficial analysis of the financial statistics of education would lend support to this view point. Between 1971-72 and 1973-74, the portion of educational expenditures allotted to teacher salaries increased from 68.9 percent to 70.4 percent which would result in less money being available for other educational resources.³ While part of this increase may be attributed to heightened professional activity and thereby contribute very little to the educational process, other factors particularly improvements in the quality of education might also be considered.

Although the question of educational quality is difficult to respond to specifically there are some general indicators of quality which can be used to assess the degree to which increased teacher salaries have resulted from changes in the quality of teacher inputs into the educational process. Indicators which can be included for consideration are: (1) improvements in the level of formal education of the teaching force; (2) increases in the overall instructional experience of the teaching force; (3) reductions in the pupil-teacher ratio⁴. For the purpose of this study it is proposed to examine the effect of these indicators on educational expenditures.

It is also possible that increases in teacher salaries might be accounted for by both factors of inflation and a dramatic change in attitude on the part of teachers towards salary negotiations. Since it is difficult to separate the effects of these factors on teacher

salaries it is proposed to use a fourth measure based on salary schedules to measure their combined effect.

In light of the expectations of a decline in student enrolments within the near future one must assess the implications of such trends on educational expenditures. One can readily speculate that an increasing proportion of the operating budget will be for teacher salary purposes. One basis for such speculation is that as the student population declines so will the number of teachers required. In such a situation one can expect the existing teaching force to be more highly qualified than in the past and also to have had a longer teaching experience. Since both of these factors are principal determinants of a teacher's salary then the portion of the budget apportioned to this expenditure may be expected to grow at a larger than usual rate.

While the effect of such factors is recognized no studies have been completed to assess their past impact on educational expenditures. It is for this reason that the study has been undertaken. Furthermore, a study of this type will provide some quantitative measures to assess the effect of the factors previously mentioned on educational expenditures and thereby assist in the planning of the future financing of education.

To undertake the analysis suggested above it is necessary to derive equations which provide a means of determining a relationship between educational expenditures and factors contributing to instructional costs. In developing these equations by multiple regression analysis it is assumed that the independent variables depend on the

values of the other independent variables as well as on the size of the change. When such an assumption is made the regression coefficients of the equations under consideration are viewed as measures of elasticity.

II. THE CONCEPT OF ELASTICITY

The purpose of this study is not to determine the proportion of total educational expenditures which constitute teacher salaries but to assess the amount of the increase in total expenditures which is accounted for by changes in factors affecting teachers' salaries. In other words the concern is about the impact of marginal increases in salaries on educational expenditures. One measure commonly used by economists to describe a relative association between two variables of the type described is the elasticity coefficient. This coefficient is essentially a ratio of the relative change of one variable and the corresponding change of the other variable in the relation being considered.⁵ The most common application of the concept is to express the change in the demand for a good with respect to a corresponding change in the price of the good or in the income of the consumer. However, since 1950 increasing use has been made of elasticities for measurements within the public sector of the economy and is a particularly appropriate measure for this study.

When the quantity demanded of a good is a function of more than one independent variable, partial elasticities may be derived. Each partial elasticity is a measure of the responsiveness of the dependent variable to changes in the independent variable with which the partial elasticity is associated, assuming the other variables remain constant. Such elasticities can be used in examining the

responsiveness of the educational expenditures to specified variables.⁶

III. STATEMENT OF THE PROBLEM

The major purpose of this study is to analyse the relationship between the growth in educational expenditures and those components of teacher salaries which reflect changes in the quality of education and the price levels of teacher services. To facilitate the above analysis it is helpful to re-state the major problem in terms of a number of sub-problems which are outlined below:

- 1) What is the elasticity of actual ordinary expenditures per pupil in the province for the period 1971 to 1977 with respect to changes in instructional costs per pupil for the:
 - a) public elementary school system?
 - b) separate elementary school system?
 - c) secondary school system?
- 2) What is the elasticity of instructional costs per pupil by type of school in the province for the period 1974 to 1977 with respect to changes in:
 - a) average teacher academic qualifications?
 - b) average teaching experience?
 - c) average pupil teacher ratio?
 - d) average beginning salary in Category A1?
- 3) Do these elasticities differ in school systems receiving maximum provincial financial support compared with those school systems receiving minimal provincial financial support?
- 4) How do teacher salaries compare with the salaries of other groups of employees within the province for a similar time

period?

6

As a concluding part of the study, the measures of responsiveness derived from the above analysis will be used to assess the implications of teacher salary factors on future educational expenditures.

IV. LIMITATIONS OF THE STUDY

Any study of this nature which is dependent on accruals of data derived under varying conditions, rather than the results of a well designed experiment, is subject to a number of imperfections and uncertainties. Thus, the reliability of the results of the analysis is dependent to some degree on the accuracy and availability of the data which are used.

This study is also limited to an examination of aggregate data at the school board level which is available from provincial sources. As a consequence, the estimates of elasticities that are calculated, do not take into account differences at the school system level. Therefore, application of the findings to individual school districts is unjustified without further analysis.

An additional limitation relates to the use of the regression equation approach which is used in deriving estimates of various income elasticities from time-series data. This procedure is most appropriate for data having a uniform variance of deviations from the fitted regression line, few extreme deviations, or deviations that are independent of one another. With observations that are taken at ordered points in time these conditions are seldom strictly satisfied since such observations cannot be treated as random.

Finally, the extensive use of variables, expressed as ratios, limits the interpretation of the magnitude of the actual changes in the variables under consideration as a ratio only indicates the

Finally, the extensive use of variables, expressed as ratios, limits the interpretation of the magnitude of the actual changes in the variables under consideration as a ratio only indicates the magnitude of one variable compared with another. Since the magnitude of the ratio is of the ratio must be considered in the interpretation of the ratio.

CHAPTER II

REVIEW OF RELATED LITERATURE

It is generally recognized that the demographic, technological, and social changes occurring within a province will necessitate an increase in expenditures for public education in the future. However, when such trends in spending are not related to independent economic variables which seem to control the expenditures then these changes are not too meaningful for purposes of projection. It therefore becomes necessary to relate educational expenditures to some measure of economic activity which acts as an indicator of future trends. In each of the studies quoted below, the most common economic indicator chosen as a significant determinant of educational expenditures is personal income which permitted estimates of income elasticities of these expenditures to be made.

Fabricant's⁷ study in 1952 was one of the original studies in which an attempt was made to explain variations in the level of state and local expenditures. Using data derived from the 1942 Census of Governments, Fabricant estimated the relationship of per capita personal income, degree of urbanization, and density of population to total expenditures per capita and to per capita expenditures of ten functional categories in the 48 contiguous states. In the category of public school expenditures, the elasticity coefficients were found to be: 0.78, with respect to 1938-1942 average income per capita, -0.04, with respect to urbanization, and -0.06, with respect to population density. From an examination of these values it would appear that one of the most important

economic determinants of school expenditures is personal income, while urbanization and population density had no significant influence on the level of expenditures.

A further attempt to estimate the income elasticity of education was made by Brazer⁸ in his study of the determinants of city expenditures. In one phase of the study the income elasticity of education was estimated for the 40 largest cities in the United States. A value of 0.73 was obtained for the coefficient when 1949 median personal income and 1953 per capita expenditures were used in a cross-section analysis.

In a study to find the determinants which would explain the differences in per pupil expenditures for public education in 27 school districts located within the St. Louis-County area, Hirsch⁹ observed a high correlation between the assessed valuation of real property and personal income. Since data on assessed values were readily available, the author used this factor as a proxy for per capita income together with total current expenditures, including debt service, to calculate the income elasticity of various components of educational spending. A value of 0.56 was obtained for the coefficient when 1951-52 and 1954-55 data were used. When debt services were omitted the value of the coefficient fell to 0.52 and an elasticity of 0.42 for instruction alone was found to be the lowest of all the categories of educational expenses considered.

Prior to this study, Hirsch analysed the historical growth of spending in elementary and secondary education using national

aggregate time-series data for 17 selected years during the period 1900 to 1958. On the basis of total current expenditures plus debt service per pupil in average daily attendance and per capita personal income data, the overall national value of the income elasticity of educational expenditures for the period 1900 to 1958 was estimated to be 1.09.

In a doctoral study, McLoone¹⁰ determined the income elasticities of education for the nation as a whole as well as for each state in the four different time periods: 1929-30 to 1957-58, 1929-30 to 1943-44, 1943-44 to 1957-58, and 1947-48 to 1957-58. These estimates were derived from diachronic data of current expenditures per pupil in average daily attendance, excluding capital outlay and debt service and per capita personal income. The nationwide value for the coefficient was found to range from a low of 0.46 for the period 1929-30 to 1943-44 to a high 1.61 for the period 1943-44 to 1957-58. Over the total time period examined, 1929-30 to 1957-58, the nationwide elasticity was estimated to be 0.99 or almost unity.

Elasticities for individual states followed a similar trend to the coefficients calculated on the basis of the aggregate data of the states. In particular it was found that during the period 1929-30 to 1943-44 no state achieved an elasticity value greater than 0.74 whereas in the 1943-44 to 1957-58 period, all states had a coefficient greater than unity.

From a study which explored the relationship of total state personal income to total state expenditures for education in five selected states during the period 1946 to 1958¹¹ indirect estimates

of the income elasticity of education were derived. Although the basic findings were reported in terms of regression coefficients, it was possible to calculate the income elasticities from the data. The approach used consisted of multiplying the particular regression coefficient by the ratio of the mean of state personal income to the mean of total state public education expenditures. These derived values of the elasticity coefficient varied from a low of 1.49 for New Jersey to a high of 2.12 for Nebraska and for all five states the coefficient was greater than one.

One phase of a cross section analysis of 1959-60 expenditure data for a nationwide sample of local school districts was concerned with the estimation of the income elasticity of educational expenditures in which different current expenditure variables were used¹². The sample consisted of 1,127 school districts from 23 states which had pupil enrolments of 300 or more. In general, the income elasticities were found to be greater for per capita than for per pupil expenditures although all values were of a relatively low magnitude. Using state personal income per capita the following elasticities were obtained: (1) 1.15 for total current expenditures per capita, (2) 0.23 for total current expenditures per pupil.

Shapiro¹³ examined determinants of current public education expenditures per pupil in average daily attendance in a series of cross section analyses for 1920, 1930, 1940, and 1950 for the American states. One phase of the study included the calculation of the income elasticity of educational expenditures by a method similar to that of James. Personal income per capita and current expenditures per pupil in average daily attendance per pupil were

the variables used in the ratio. The values obtained for the coefficient were 0.99 in 1920, 0.72 in 1930, 0.71 in 1940, and 0.91 in 1950.

Since studies of determinants of educational expenditures often include a section concerned solely with income elasticities of education it is interesting to note that one of the first examinations of this coefficient in Canada is to be found in such a study¹⁴. The main purpose of this study was to examine the determinants of current expenditures per pupil in average attendance in each of the ten provinces of Canada. The procedure used in computing the elasticities was identical to the method used by Shapiro in which the income net regression coefficient produced in an earlier part of the study, was multiplied by a ratio of the mean value of personal income to the mean value of the current educational expenditures (in constant dollars). By this method, values for the coefficient were obtained for 1941, 1951, and 1961. In general the elasticities increased by small degrees from 1941 to 1961. The actual nationwide values of the income elasticity of educational expenditures were 0.93 in 1941, 0.99 in 1951, and 1.12 in 1961. Given the differences in data, definition, and time periods these findings are reasonably consistent with the findings of comparable United States studies.

Another Canadian study which provided estimates of income elasticity, but in this case for each of the Canadian provinces for the period 1951 to 1962, based the calculations on a linear regression between per capita personal income and either expend-

itures per pupil in average daily attendance or expenditures per capita¹⁵. The overall mean elasticity for pupil expenditures was 2.2. The income elasticities based on per pupil expenditures ranged from a low of 0.41 for New Brunswick to a high of 2.90 in Ontario. The values of the ratio based on per capita expenditures were somewhat higher and fell between a minimum of 0.74 for New Brunswick and a maximum of 3.41 for Alberta. Though these values, on the whole, were substantially higher than equivalent values for the United States they do not necessarily reflect greater willingness on the part of the Canadian citizens to support public education. The author, in conclusion, indicated that factors such as the exclusion of federal transfer payments, non-tax sources of revenue and the inclusion of capital costs in the expenditure data would serve to distort the estimates of the elasticity coefficient.

Atherton¹⁶, in a subsequent study, estimated the income elasticity of education for the periods 1957 to 1960 and 1961 to 1965 in Alberta for the purpose of examining any effects which might have occurred due to the change made in 1961 in the system of financing education. In both cases, the coefficient was computed from data on personal income per capita in Alberta and expenditures on operations per weighted pupil enrolled in Alberta public schools. Prior to the adoption of a new system of financing, the income elasticity was estimated to be 3.0 whereas subsequent to the change the coefficient fell drastically to 0.9. Thus, a decided change in the willingness of Albertans to support education occurred coincidentally with the introduction of a new method of financing education.

In 1971, Sharples¹⁷ conducted a study to examine the affect of changes in economic growth of each province during the years 1930-66 on educational expenditures. The basis for the analysis was the concept of partial coefficients of elasticity. The study showed that the demand for education varied considerably from province to province and time period to time period. The study concluded with a use of elasticities in a method of fiscal planning to predict future demand for education and its financial support under differing conditions of economic growth.

While the above studies have examined the effect of economic and social factors on educational expenditures no recognition is made of the dramatic changes in teachers' salaries which occurred in the sixties and seventies. In fact, the literature devoted to this explanation of such increases is not extensive. However, a number of studies in the United States have attempted to assess the extent to which unionization explains the growth in teachers' salaries. For example, Hellrlegal, French and Peterson¹⁸ undertook a behavioural analysis of collective bargaining attitudes among teachers and found that lower relative salaries were associated with positive attitudes toward collective negotiations. However, no attempt was taken to determine if collectively negotiated salaries were significantly higher than non-negotiated salaries.

Two other studies focussed upon this issue but arrived at different conclusions. Kasper¹⁹ studied average teachers' salaries and percentages of teachers unionized and found no consistent relationship between the two factors. In contrast, Thornton²⁰,

using data from eighty-seven large school systems found that unionization was significantly and positively related to teachers' salaries. A study by Schemenner²¹ using data for eleven American cities for the time period 1962-70 confirms that unionization is an important factor in setting teacher salaries in the United States but not the only significant factor. Landon and Baird²² in a study on the effects of competition in the market for teachers concluded that local school districts in the United States did compete strongly with each other for first year teachers. As a result, salaries of teachers were found to be lower where districts are few and large in a given metropolitan area, whereas salaries were higher where many small districts competed for teaching personnel.

CHAPTER III

THE RESEARCH DESIGN

I INTRODUCTION

The major purpose of this chapter is to explain, in some detail, the variables which are employed in this study and the sources employed to derive the necessary data. A further section deals specifically with the analytical technique employed. In particular, attention is given to the alternative methods by which to calculate elasticity coefficients followed by an explanation of the technique selected for this study.

II REQUIRED VARIABLES

Educational Expenditures

A number of spending measures may be employed to represent educational expenditures. One approach is to restrict this measure to current ordinary expenditures by omitting capital outlays and debt services since capital expansion occurs on an irregular basis. A case may also be made for the inclusion of interest charges and debt repayments in annual educational expenditures as they are much less erratic over time than capital investments. However, for purposes of this study, educational expenditures consists of those items which are considered to be recognized ordinary expenditures for provincial grant purposes. Thus, extraordinary expenditures such as transportation and approved capital expenditures are omitted.

Such current expenditures may be treated in the aggregate form or as a ratio to some independent variable. The use of the aggregate form is limited in that it does not account for fluctuations in

either the total population or the pupil enrolments of the province. Of the two common ratio measures, per capita and per pupil current expenditures, the latter is more suitable in this study as it reflects an average measure of the educational service received by each student in the province and also provides a common base for comparisons over the time period.

A further factor which requires consideration is the change in prices due to inflationary factors rather than an appreciation in the value of money. While it is recognized that available price indexes suggest a differential movement over a period of time in both the general price level and the education price level, the results are primarily determined by the choice of the price index. Since there is no specific education price index for Ontario, the use of an inappropriate index can be just as misleading as relying on current dollar expenditures. Therefore, from the standpoint of this study, and in the absence of any generally accepted education price index, current dollars will be used as a measure of expenditures.

Instructional Expenditures

While it would have been most desirable to use the total teachers' salaries for each school board such data was not readily available for each of the years included in the study. Consequently, an alternative measure was selected, namely instructional expenditures. According to the Code of Accounts used by the Ministry of Education this particular code "Instructional Expenditures" includes, in addition to instructional personnel salaries, expenditures associated with the purchase of text books and the administration of the educational system, both at the school and board level. Although several items

are included in this particular code, the largest and most significant item is the total salary of the instructional staff which was the major reason for selecting this particular code.

Once more this variable is treated in a ratio format identical to the one employed with educational expenditures. Furthermore, it is also recognized that while inflationary factors will contribute to increases in this factor the reasons given previously for expressing expenditure variables in current dollars also applies.

Teaching Experience

Teaching experience refers to the number of years of teaching experience recognized for salary purposes. Thus, the total number of years of teaching experience in each school board was determined by summing up the product of the number of teachers in each experience category provided by the board's salary grid and the corresponding years of teaching experience recognized for salary purposes. This calculation was made for each year.

Since the number of teachers employed by individual school boards varies considerably it was felt that such aggregate data would be inappropriate in a comparison among school boards. Consequently, for the purposes of this study the average teaching experience for each school board was calculated and used in the analysis.

Academic Qualifications

This variable is limited to those academic qualifications which are recognized for salary purposes in the grid only. For reasons cited above, an average measure of academic qualifications

for each school board was considered most appropriate. To arrive at a numerical measure of academic qualifications each of the salary categories was assigned a value. Category D was assigned a value of 1 and Category A4 was given a value of 7. The intervening categories were assigned values in such a manner that there is a unit increase from one category to the next.

To arrive at the average academic qualifications for a given board, the sum of the product of the number of teachers in each salary category and the value assigned the corresponding category was divided by the number of teachers included in the salary grid distribution.

Pupil Teacher Ratio

This ratio was obtained for each school board from Ministry of Education records. In all cases, the pupil teacher ratio excluded supervisory officers, consultant staff and other professional staff in the teacher component of the ratio.

Beginning Salary

For purposes of this study the beginning salary was considered to be the salary received by a teacher with no previous teaching experience. Within the salary grid a beginning salary exists for each category based upon recognized academic qualifications. Since persons now entering the teaching force must have an undergraduate degree it was felt that the most appropriate measure of this variable was the beginning salary for Category A1.

III COLLECTION OF DATA

Originally the study was to have been based upon data for the period 1970-71 to 1975-76. Unfortunately consistent data for this time period was not available for all the variables. Consequently, a slight adjustment has been made in which data for the calendar years 1974 to 1977 was used for a more complete analysis. A partial analysis of data for the period 1971 to 1973 is also included.

All of the data for the previously mentioned variables was gathered either directly or indirectly from June Board Reports prepared by Boards of Education or Roman Catholic Separate School Boards and from publications of the Ministry of Education. Other school boards such as District School Area Boards; Canadian Forces Bases; Hospitals and Treatment Centres were omitted. In order to assess any possible differences in elasticities among the school boards with different levels of provincial support elasticity measures were calculated for six school boards with the highest equalized assessment per pupil and a similar number of boards with the lowest equalized assessment per pupil.

IV TREATMENT OF DATA

No matter which of the dependent variables is analysed, an estimation of elasticity coefficients by one of two common methods is required. Thus, this part of the chapter consists of a description of the basic approach to the estimation of elasticity coefficients. This is followed by a brief explanation of the specific application of the concept to the criterion variables under consideration.

The Elasticity Coefficient

The elasticity (e) of any dependent variable may be defined as the ratio of the percentage change in the dependent variable (X) to a given percentage change in the independent variable (Y). The relation may also be expressed mathematically in the following manner:

$$e = \frac{\frac{\Delta X}{X}}{\frac{\Delta Y}{Y}}$$

This method is commonly used to measure changes between a dependent and an independent variable within a short period of time: (i.e. a year or less) and is called the cross-section approach. Although it is considered a static method, it has the advantage of holding constant a number of relationships such as changes in the composition and distribution of income or changes in provincial or federal grant patterns.²³

To derive the elasticity coefficient using other types of data requires a different approach which in effect summarizes the data and presents an average elasticity coefficient. This approach involves the use of the simple least squares regression analysis of the form:

$$e = \frac{\log X + \log A}{\log Y}$$

which assumes the coefficient to be constant over time.

Under this assumption, the dependent variable is log linear to the independent variable and may be written:

$$X = AY^e$$

For both equations, X represents the dependent variable, Y the independent variable, e the income elasticity and A is a constant.

In contrast to the previous approach, this method is considered to be dynamic with the consequence that the many economic and fiscal changes that influence income and revenue patterns are not held constant.

The above procedure gives no consideration to more than one predictor variable. Estimates of the responsiveness of the dependent variable to more than one independent variables may be made with the application of multiple linear regression techniques to the data. Elasticity coefficients derived by this method depend not only on the size of the change in the variables concerned but also the value of the other independent variables. In this study elasticities will be determined using both one independent variable and several.

Elasticity of Educational Expenditures

The elasticity measure of educational expenditures in this analysis is based upon one independent variable, instructional expenditures per pupil. Thus, the elasticities calculated estimate the percentage change of per pupil educational expenditures with respect to a one per cent change in instructional expenditures per pupil which will reflect the relationship of the growth of these two factors. The mathematical relationship may be expressed as follows:

$$E = f(S)$$

Where E is the educational expenditure per pupil and S represents the instructional expenditures per pupil. When expressed as a regression equation the relationship takes the following form:

$$E = A.S^{e1}$$

Where A is the constant of integration and e_1 , is the elasticity of educational expenditures with respect to instructional expenditures. However, to estimate the elasticities it is more convenient to use the logarithmic form of the above regression equation:

$$\log E = \log A + e_1 \cdot \log S$$

Elasticity of Instructional Expenditures

In this analysis consideration is given to those independent variables which might have the greatest effect on instructional expenditures per pupil. Consequently, the calculation of elasticities of instructional expenditures take into consideration average teaching experience; average academic qualifications; beginning salary and pupil teacher ratio for each school board in the province.

Once the selection of the factors which are considered to affect instructional expenditures is made it is possible to express the relationship as a mathematical function. Since more than one independent variable is involved it is assumed that some interaction exists between them. In this case, the mathematical relationships may be expressed in the following manner:

$$S = f(T, Q, B, G)$$

where S is instructional expenditures per pupil, T is the average teaching experience for each board, Q is the average academic qualification for each board, B is the beginning salary in category A1 for each board and G is the average pupil teacher ratio for each board. To account for the interaction of the independent variables the relationship may be expressed as a multiple regression equation

which takes the following form.

$$S = A.T^{e_1}. Q^{e_2}. B^{e_3}. G^{e_4}$$

Where A is the constant of integration and e_x is the elasticity of instructional expenditures with respect to each of the independent variables considered. However, in order to estimate the relevant elasticities it is more convenient to use a logarithmic form of the above equation.

$$\log S = \log A + e_1 \log T + e_2 \log Q + e_3 \log B + e_4 \log G$$

The elasticity of a particular variable indicates the responsiveness of instructional expenditures to a change in any one of the independent variables if all the remaining variables stay constant.

In all of the multiple regression analyses suggested above, elasticities are calculated for each year that data is available. An average elasticity for the period 1974-77 is also determined to assess present trends in instructional expenditures on the financing of public education in Ontario. Furthermore, an average elasticity for the period 1971-77 is calculated to examine the overall relationship between changes in instructional expenditures and changes in educational expenditures.

CHAPTER IV

ELASTICITIES OF EDUCATIONAL AND INSTRUCTIONAL EXPENDITURES

The findings and interpretations presented in this chapter relate to the empirical analysis of the two measures of expenditures in Ontario school systems. Part one focuses upon the findings which involve the elasticities of educational expenditures per pupil to changes in instructional expenditures per pupil. The second phase is concerned with the responsiveness of instructional expenditures per pupil to changes in selected independent variables. The variables selected for this study and the statistical technique employed are outlined in the previous chapter.

1 MEASURES OF EDUCATIONAL AND INSTRUCTIONAL EXPENDITURES

Since measures of elasticity only describe the relationship between changes in the dependent and independent variables it is appropriate and useful to provide some commentary on the range of the values of the variables employed. These comments are limited to an examination of the annual provincial mean and standard deviation of each measure under consideration between 1974 and 1977.

From the data presented in Table 1 it is evident that both mean measures of expenditures per pupil for secondary schools are consistently higher than for the other types of schools. This observation is to be expected because of the higher percentage of teachers with degrees and the substantive differences in school organization and curriculum within secondary schools which have a direct bearing on costs. It is of further interest to note that the difference in either of the expenditure measures for separate

TABLE I
PROVINCIAL MEANS AND STANDARD DEVIATIONS OF EXPENDITURES
BY YEAR AND TYPE OF BOARD, 1974-77

Year	Type of Board	Instructional Expenditures Per Pupil (\$)		Educational Expenditures Per Pupil (\$)	
		Mean	S.D.	Mean	S.D.
1974	Separate	600	38.13	771	74.40
	Public	630	79.50	791	104.00
	Secondary	1080	72.28	1315	93.79
1975	Separate	763	49.87	981	89.00
	Public	785	82.15	984	112.00
	Secondary	1263	84.65	1544	105.00
1976	Separate	936	74.20	1147	101.00
	Public	962	109.00	1170	150.00
	Secondary	1480	102.00	1764	167.00
1977 ^e	Separate	1055	79.00	1318	102.00
	Public	1089	120.00	1350	172.00
	Secondary	1644	109.00	2002	175.00

^e estimated

and public schools is very small although consistently in favor of the public schools.

The standard deviation measure is useful in describing the distribution of the actual data. The values for this measure suggest that there is little variance of expenditures among the majority of the schools in the province.

II INTERPRETATION OF ELASTICITIES

The elasticity coefficients used in this chapter are derived from the application of linear regression analysis to the logarithmic values of the particular variables considered. When these logarithmic values are subjected to such analysis, the weights assigned to the independent variables may be used as the elasticities of these variables with respect to the dependent variable. The elasticity of a particular variable indicates the responsiveness of the dependent variable to changes in the independent variable, if all other variables remain constant. Thus an elasticity of educational expenditures per pupil of 2.46 indicates that educational expenditures per capita increase by 2.46 per cent for every one per cent increase in per pupil instructional income.

The sign of each regression coefficient (or elasticity coefficient) is important. Should the sign of the coefficient be the reverse of the expected direction of influence it is evident that the variable in question is acting as a "suppressor" variable. Thus, although the two variables may be positively correlated, the regression weight or elasticity coefficient of the independent variable may be negative which means that an increase of the independent variable is associated

with a decrease of the dependent variable, if all other variables remain constant. For example, if the elasticity of educational expenditures per capita were -2.46, then if all other variables remain constant, and the per pupil instructional expenditures increases by one per cent, the per pupil educational expenditures will decrease by 2.46 per cent.

Additional statistics reported in conjunction with the elasticities include the following: the constant of the derived regression equation and the square of the multiple correlation (R^2) stated in a percentage form. This latter statistic is an indication of the per cent of variance in the dependent variable which may be associated with the variation of the independent variables used in the particular regression analysis. A high R^2 indicates that the model is a good predictor of changes in the dependent variable.

An immediate and recurring problem in this study is the level of significance at which computed elasticities are acceptable. The resolution of this issue is assisted by the use of stepwise linear regression. With this method, the change in the value of R^2 is known with the addition of one more independent variable. The acceptability of an additional variable and thereby a further partial elasticity was based upon the additional contribution that the new variable made to R^2 . If the value increased by more than 5 per cent then the variable was accepted.

III ELASTICITY OF EDUCATIONAL EXPENDITURES: FINDINGS

By way of introduction it should be emphasized at this point that elasticity measures basically summarize the changes that have

occurred in the variables considered. Furthermore, this type of analysis does not consider the change in levels of expenditures for individual school boards but merely provides an overall provincial picture.

The above term "elasticity of educational expenditures" is a measure of the responsiveness of current expenditures in education per pupil to changes in per pupil expenditures for instructional purposes. The elasticities for each year between 1971 and 1977 are presented in Table II. The absence of an elasticity coefficient indicates that the R^2 statistic was so low that the equation derived was not considered to be a satisfactory predictor of the effect of changes in instructional expenditures on changes in educational expenditures. On the basis of this criteria no significant income elasticity coefficients were derived for one or more school types in 1971, 1972, 1973 and 1977.

For the period 1971-77 the significant income elasticities range in value from 0.71 for secondary schools in 1976 to 1.27 for separate schools in 1974. Those elasticities with a value of less than unity indicate that the increases in educational expenditures are not commensurate with those of instructional expenditures. In contrast, those elasticities above unity indicate that educational expenditures are rising at a faster rate than are instructional expenditures.

To discern any particular trend for each type of school over the total time period under consideration is difficult because of fluctuations in elasticities. However, some trends are observable

TABLE II
ELASTICITY COEFFICIENTS OF EDUCATIONAL EXPENDITURES
BY YEAR AND TYPE OF SCHOOL, 1971-77

Year	Type of School	Constant	Instructional Expenditures	R ²
1971	Separate	-	-	-
	Public	-0.16	1.06	93.79
	Secondary	0.64	0.93	44.15
1972	Separate	0.11	1.01	91.90
	Public	-	-	-
	Secondary	-	-	-
1973	Separate	-	-	-
	Public	1.62	0.77	33.97
	Secondary	-	-	-
1974	Separate	-1.50	1.27	74.04
	Public	0.16	1.01	95.25
	Secondary	0.77	0.92	76.75
1975	Separate	-1.02	1.19	74.47
	Public	-0.11	1.05	91.53
	Secondary	1.60	0.80	62.74
1976	Separate	0.19	1.00	76.21
	Public	-0.01	1.03	81.74
	Secondary	2.25	0.71	28.29
1977 ^e	Separate	0.48	0.96	84.24
	Public	-0.57	1.11	91.84
	Secondary	-1.14	1.18	79.55

^e estimated

for the time period 1974-77. In the case of the separate schools it would appear that the value of the elasticity coefficient has consistently diminished. On the other hand, the elasticity measures for public and secondary schools have increased over the time period. With the exception of 1977, it would appear that in each year of comparison the responsiveness of secondary schools educational expenditures was less than that of either of the two other types of schools.

When the average elasticity measures are calculated for the time period, 1971-77 a reduction of the wide range of values occurs (see Table III). For example, the elasticity measures for secondary schools presented in Table II ranged between 0.80 and 1.18 while the average value for the period under observation was 0.67. In addition, it is of interest to note that all of the elasticities shown in Table III are less than unity.

The effect of the level of provincial financial support for education on the responsiveness of educational expenditures to changes in instructional expenditures may be observed in Table IV. In this table, elasticity measures are provided for each year from 1971 to 1977 inclusively for those school boards receiving the highest or the lowest provincial support through general legislative grants. Elasticity measures for those school boards receiving the lowest level of provincial support range from 0.62 for secondary schools in 1976 to 1.71 for similar schools in 1977. The range of elasticities was not as great for boards receiving the highest level of provincial support. The lowest elasticity calculated is 0.51 for separate school boards in 1971 whereas 1.22 is the highest

TABLE III
 AVERAGE ELASTICITY COEFFICIENTS OF EDUCATIONAL EXPENDITURES
 BY TYPE OF SCHOOL FOR THE PERIOD 1971-77

Type of School	Constant	Instructional Expenditures	R ²
Separate	2.36	0.67	59.07
Public	0.62	0.94	90.68
Secondary	2.45	0.67	59.04

TABLE IV
ELASTICITY COEFFICIENTS OF EDUCATIONAL EXPENDITURES
BY YEAR, TYPE OF SCHOOL AND LEVEL OF PROVINCIAL SUPPORT, 1971-77

Year	Type of School	LOWEST PROVINCIAL SUPPORT			HIGHEST PROVINCIAL SUPPORT		
		Constant	Instructional Expenditure	R ²	Constant	Instructional Expenditure	R ²
1971	Separate	1.25	0.83	92.17	3.24	0.51	73.36
	Public	-0.04	1.05	92.53	0.05	1.02	96.13
	Secondary	-	-	-	1.26	0.84	87.08
1972	Separate	-	-	-	1.16	0.85	88.53
	Public	-	-	-	2.05	0.71	94.87
	Secondary	-3.52	1.54	95.13	1.27	0.84	81.37
1973	Separate	-0.26	1.08	96.66	-	-	-
	Public	-0.18	1.06	88.31	-	-	-
	Secondary	-1.39	1.23	92.73	3.23	0.56	78.51
1974	Separate	-0.66	1.14	93.31	1.75	0.77	63.47
	Public	0.55	0.95	93.05	2.32	0.67	79.19
	Secondary	-0.84	1.15	88.79	2.88	0.62	86.07
1975	Separate	0.75	1.14	97.53	-1.12	1.20	56.17
	Public	1.38	0.83	78.19	2.03	0.73	84.15
	Secondary	-	-	-	3.39	0.56	74.61
1976	Separate	-1.30	1.21	82.03	-1.34	1.22	86.01
	Public	0.96	1.07	91.65	-1.29	1.22	95.50
	Secondary	2.97	0.62	21.18	1.23	0.86	49.79
1977 ^e	Separate	0.79	0.91	85.67	1.84	0.77	96.45
	Public	0.59	0.95	83.52	0.99	0.89	80.64
	Secondary	-5.05	1.71	86.12	1.32	0.85	79.36

^e estimated

measure of responsiveness which is credited to both separate and public school boards in 1976.

Once more no discernable pattern is observable for the overall time period but comments can be made regarding the period 1974-77. In virtually all cases secondary schools of boards receiving the highest financial support have elasticity measures which are consistently lower than for other types of school regardless of the level of funding received. Furthermore, the responsiveness of educational expenditures to changes in instructional expenditures tended to be the highest for separate schools.

When the data for the time period under consideration is combined to calculate average elasticities for 1971-77 the range of the measures is limited (see Table V). Moreover, with the exception of public schools receiving the lowest financial support from the provinces the remaining elasticities closely approach a value of one.

IV MEANS AND STANDARD DEVIATION OF INDEPENDENT VARIABLES

The findings of the second part of the empirical analysis are presented in this part of the chapter. Thus, this section of the report examines the responsiveness of instructional expenditures per pupil to changes in average teaching experience; average academic qualifications; average beginning salary and the pupil teacher ratio of the school boards included in the study.

Since measures of elasticity do not provide any indication of the actual values of the variables under consideration it is useful to provide some commentary on the range of values of the independent variables employed in the analysis. These comments are limited to

TABLE V
AVERAGE ELASTICITY COEFFICIENTS OF EDUCATIONAL EXPENDITURES
BY TYPE OF SCHOOL AND LEVEL OF PROVINCIAL SUPPORT
FOR THE PERIOD 1971-77

Type of School	LOWEST PROVINCIAL SUPPORT			HIGHEST PROVINCIAL SUPPORT		
	Constant	Instructional Expenditure	R ²	Constant	Instructional Expenditure	R ²
Separate	0.24	0.99	92.60	0.48	0.96	97.84
Public	2.35	0.68	57.51	0.24	0.99	91.94
Secondary	0.48	0.96	86.08	0.33	0.98	93.54

a review of the provincial means and standard deviations of each independent variable used in the multiple linear regression analysis. These measures for each year between 1974 and 1975 inclusively are presented in Table VI.

The mean teaching experience exhibits a slight increase from year to year for each of the types of schools. Within this pattern, the mean value of teaching experience in secondary schools is consistently higher than that for the other types of schools. However, in more recent years the difference in the means among the types of schools has narrowed. In 1974 the value of this factor ranged from 6.10 years to 7.60 years whereas in 1977 although the mean value had increased the range extended from 8.09 year to 8.74 years. However, it would appear that the variance as measured by the standard deviation increased slightly.

Similarly the mean measure of academic qualifications increases slightly over the time period under consideration with the exception of secondary schools in 1977. In each year the average value of this measure for secondary schools is significantly higher than that for either separate or public schools and increases from 6.14 in 1974 to 6.37 in 1976. In comparison, the average measure of academic qualifications for public schools for the same time period ranged from 3.03 to 3.66. In contrast to the teaching experience measure the variance for academic qualification became smaller over the years.

Little difference is observed among the mean beginning salaries for each type of school. This observation is to be expected since

TABLE VI
PROVINCIAL MEANS AND STANDARD DEVIATIONS OF VARIABLES UNDER CONSIDERATION
BY YEAR AND TYPE OF SCHOOL, 1974-77

Year	Type of Board	Teaching Experience		Academic Qualifications		Beginning Salary		Pupil Teacher Ratio	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1974	Separate	6.10	0.62	2.85	0.50	7832	436	24.73	2.77
	Public	6.31	1.06	3.03	0.62	7483	971	24.49	1.99
	Secondary	7.60	1.04	6.14	0.54	7591	413	17.29	1.20
1975	Separate	7.34	0.96	3.16	0.49	8640	596	21.45	2.30
	Public	7.93	0.99	3.36	0.56	8314	577	22.31	2.02
	Secondary	8.12	1.40	6.27	0.37	8349	647	16.73	0.86
1976	Separate	8.16	1.12	3.48	0.49	10462	587	23.93	2.50
	Public	8.70	1.02	3.66	0.48	10651	763	21.27	1.49
	Secondary	8.70	1.37	6.37	0.37	10665	842	17.01	0.97
1977 ^e	Separate	8.09	1.42	3.65	0.42	11341	591	21.69	2.47
	Public	8.73	1.36	3.80	0.36	11563	632	20.89	1.54
	Secondary	8.74	1.21	6.08	0.20	11631	622	16.87	0.81

^e estimated

the measure employed was the beginning salary offered by a board to a person entering category A1 with no teaching experience. In contrast, the mean value increased significantly between 1974 and 1977. For example, the average beginning salary for public school teachers rose from \$7483 to \$11,571 within this time period.

The mean pupil teacher ratio for all school types experienced a decline within the time frame under consideration. However, the reduction was somewhat greater for both types of elementary schools. For example, between 1974 and 1977, the mean pupil teacher ratio for secondary schools declined from 17.29 to 16.89 whereas the same measure for public schools changed from 24.49 to 20.89.

V ELASTICITY COEFFICIENTS OF INSTRUCTIONAL EXPENDITURES

This phase of the study examines the responsiveness of instructional expenditures per pupil to changes in the variables described above which are considered to have an important bearing on changes in the quality of education and the price level of teacher services. Details regarding the calculation of elasticity coefficients and their interpretation has been adequately dealt with earlier. The presentation of these findings is identical to the format used to examine the elasticities of educational expenditures.

Table VII reports the coefficients which show the responsiveness of instructional expenditures per pupil to changes in the variables selected for each year between 1974 and 1977 inclusively. Both the level and significance of the responsiveness of instructional expenditures to a one per cent change in the level of teaching experience is quite limited. Only three values of this partial

TABLE VII
ELASTICITY COEFFICIENTS OF INSTRUCTIONAL EXPENDITURES
BY YEAR AND TYPE OF SCHOOL, 1974-77

Year	Type of School	Constant	Teaching Experience	Academic Qualifications	Beginning Salary	P.T.R.	R ²
1974	Separate	7.36	-	-	-	-0.30	29.33
	Public	-	-	-	-	-	-
	Secondary	8.36	0.14	-0.15	-	-0.49	30.31
1975	Separate	5.72	-	-	-	-0.31	31.46
	Public	3.35	-	0.19	0.43	-0.32	28.06
	Secondary	8.71	-	-	-	-0.57	26.74
1976	Separate	5.11	-	-	-	-0.45	29.72
	Public	9.68	-	0.28	-	-0.96	63.01
	Secondary	9.60	0.09	-	-	-0.81	25.36
1977 ^e	Separate	3.33	0.11	-	0.41	-0.15	35.28
	Public	-	-	0.50	0.38	-0.83	64.38
	Secondary	4.40	-	0.80	0.44	-0.89	52.45

^e estimated

elasticity are recorded which range from 0.09 for secondary schools in 1976 to 0.14 for secondary schools in 1974.

The frequency and range of significant partial elasticities of academic qualifications are somewhat greater. Consequently, a total of five observations are recorded ranging from a low of -0.15 for secondary schools in 1974 to a high of 0.80 for similar schools in 1977. The number of partial elasticities of beginning salaries is also somewhat limited. Only four measures are exhibited which lie within a narrow range of 0.38 to 0.44.

In contrast, the measures of responsiveness to changes in the pupil teacher ratio are reported on all occasions but for the public schools in 1974. The range of this partial elasticity extends from -0.15 for separate schools in 1977 to -0.96 for public schools in 1976. It is of particular interest to note that each of the pupil teacher ratio elasticities recorded are negative. Such a finding is to be expected for as the pupil teacher ratio declines then increase in expenditures are to be anticipated.

No dominating trends are discernable in these elasticities since no one type of school maintains a consistent pattern of elasticities over the years. Perhaps the only consistent pattern that is evident is all of the measures are less than unity. This situation may be partially accounted for by the fact that the per cent of variance in instructional expenditures per pupil accounted for by the independent variables selected is not particularly high. However, there is a slight improvement in the value of R^2 as one progresses through the time period under observation.

When the data for the four year period 1974-77 are combined to produce a single set of average elasticities two factors can be observed (see Table VIII). First, the partial elasticities attributable to changes in the pupil-teacher ratio for public and secondary schools exceed unity with the values of -1.20 and -1.43 respectively. Second, the other partial elasticities are relatively low ranging from -0.06 to 0.43. Once more, the ability of these variables to predict changes in instructional expenditures per pupil is quite limited since the values of R^2 do not exceed 60.73 per cent.

The coefficients presented in Table IX denote the elasticities of the dependent variable with respect to changes in the independent variables for school boards receiving the highest and the lowest provincial support. Those boards receiving the lowest provincial support tend to exhibit a smaller range of partial elasticities with lower values being predominant. For example, the range of elasticities which reflects the effect of changes in teaching experience on changes in instructional expenditures per pupil is -0.28 to 0.62 for boards receiving the lowest levels of provincial grants in contrast to a range of -0.04 to 1.25 for the other type of boards. Similar examples can be observed among the other partial elasticities. It is of additional interest to note that the value of R^2 is higher and more consistent for school boards receiving the greatest provincial financial support.

A further observation of note is the presence of positive values for the pupil teacher ratio partial elasticity. This particular elasticity indicates the percentage change in the instructional expenditures per pupil with every one per cent change in the pupil

TABLE VIII

AVERAGE ELASTICITY COEFFICIENTS OF INSTRUCTIONAL EXPENDITURES
BY TYPE OF SCHOOL FOR THE PERIOD 1974-77

Type of School	Constant	Teaching Experience	Academic Qualifications	Begin. Salary	P.T.R.	R ²
Separate	7.92	0.24	0.42	0.06	-0.53	42.61
Public	9.93	0.18	0.43	0.04	-1.20	60.73
Secondary	11.05	0.15	0.19	0.03	-1.43	33.26

TABLE IX

ELASTICITY COEFFICIENTS OF INSTRUCTIONAL EXPENDITURES
BY YEAR, TYPE OF SCHOOL AND LEVEL OF PROVINCIAL SUPPORT, 1974-77

YEAR	TYPE OF SCHOOL	LEVEL OF PROVINCIAL SUPPORT	Constant	Teaching Experience	Academic Qual.	Begin. Salary	P.T.R.	R ²
1974	Separate	Lowest	4.27	0.62	0.66	-0.21	0.68	99.50
	Public		16.24	0.31	0.12	-1.16	-	45.82
	Secondary		-12.41	0.25	0.17	2.01	-	71.38
1975	Separate	Lowest	1.25	-	0.30	0.46	-	48.03
	Public		-1.82	0.33	0.36	0.60	0.65	59.32
	Secondary		9.37	-0.28	-	-0.38	0.62	56.29
1976	Separate	Lowest	6.98	-	0.77	-	-0.38	74.01
	Public		9.35	-0.28	0.24	-	-0.69	61.38
	Secondary		-5.51	0.10	0.59	1.41	-0.56	45.64
1977 ^e	Separate	Lowest	-11.09	0.11	-	1.91	-	56.31
	Public		0.31	-	-	0.89	-0.50	34.98
	Secondary		-4.35	0.13	2.02	1.09	-0.87	82.65
1974	Separate	Highest	-36.41	1.25	-0.76	4.57	-	99.80
	Public		-7.16	0.11	-	1.13	1.03	98.07
	Secondary		20.67	1.08	0.89	-1.75	-0.58	99.97
1975	Separate	Highest	7.51	0.12	-0.03	-	-0.34	80.02
	Public		-2.67	0.41	0.17	0.77	0.43	93.61
	Secondary		15.41	0.03	-0.14	0.03	-2.97	99.42
1976	Separate	Highest	19.71	-	1.33	-1.04	-1.50	92.75
	Public		6.03	0.91	-	-0.12	-	90.31
	Secondary		-50.09	-	0.86	5.55	1.35	90.11
1977 ^e	Separate	Highest	3.95	0.53	1.10	0.30	-0.76	93.17
	Public		2.93	1.09	0.41	0.31	-0.59	65.99
	Secondary		4.10	-0.04	2.07	0.41	-1.45	99.81

^e estimated

teacher ratio. Since the instructional expenditures increase with a decrease in the pupil teacher ratio one would expect to find that this partial elasticity would always have a negative value. However, positive values are observable for each year except 1977. These values range from a low of 0.43 for public schools receiving the greatest provincial support in 1975 to 0.35 which is attributed to secondary schools in 1976 receiving the highest provincial support.

When the data is combined to provide average values for the partial elasticities for the period 1974-77 the range of values is reduced. For example, partial elasticities which account for changes in beginning salary in schools boards receiving the highest provincial support ranged from -1.75 for secondary schools in 1974 to 5.55 for secondary schools in 1976. By contrast, the average values for the various schools presented in Table X ranged from 0.07 to 1.00.

The ability of the combined efforts of the four independent variables to explain the variance of instructional expenditures per pupil of the two types of school boards considered is significantly better than when all school boards were considered. However, it must be remembered that these statistical analyses provide no more than a mathematical description of the interrelation of a particular set of independent variables and the dependent variable in a selected time period. Thus, it is possible to select different sets of predictor variable.

TABLE X

AVERAGE ELASTICITY COEFFICIENTS OF INSTRUCTIONAL EXPENDITURES
BY TYPE OF SCHOOL AND LEVEL OF PROVINCIAL SUPPORT FOR THE PERIOD 1974-77

TYPE OF SCHOOL	LEVEL OF PROVINCIAL SUPPORT	Constant	Teaching Experience	Academic Qual.	Begin. Salary	P.T.R.	R ²
Separate		6.45	0.39	1.37	-0.23	-	72.45
Public	Lowest	-0.24	-	-	0.91	-0.39	77.21
Secondary		-0.68	-	-	0.86	-	92.47
Separate		-1.17	0.24	-	1.00	-0.60	87.76
Public	Highest	2.49	0.53	0.32	0.46	-0.48	93.50
Secondary		11.96	0.11	-0.36	0.07	-1.75	31.11

CHAPTER V
IMPLICATIONS OF THE FINDINGS .

I USE OF ELASTICITIES

In recent years educational expenditures have continued to rise at a rather significant rate despite a decline in enrolments. Since teachers' salaries constitute the major expenditure item in any school budget it is not surprising that this budget item is often singled out as the dominant cause for the continued increase in educational expenditures. What is not always recognized by such commentators is that increases in teacher salaries may be a consequence of factors other than attempts by teachers to improve their salaries relative to those in other positions. For example, increases in price levels due to inflation and improvements in the quality of education have some bearing on the level of salaries and thereby educational expenditures. The calculation of elasticities is helpful in assessing the relationship of changes in such factors with changes in educational expenditures. However, some initial explanation of the interpretation of elasticities will be helpful.

Previous studies in education which have employed the elasticity concept have used it to measure the demand for education by calculating income coefficients of expenditures as an indicator of the demand for education. This use is based on Wagner's concept that demand for a public good is essentially determined by the level of per capita income.

Wagner²⁴ observed, as early as 1863, that as a per capita income increases in industrial nations the public sector grows in

relative importance with respect to the private sector. On the basis of these observations, Wagner predicted a considerable relative expansion of cultural and welfare expenditures, especially with respect to income redistribution and education. The basis for this prognostication lies on his assumption that public services constitute a type of "superior" or "luxury" goods, of which more would be demanded as income per capita rises.*

While the use of elasticities in public education has been primarily restricted to a measure of the public demand for education with increases in personal income this study is interested in a somewhat different application of the elasticity measure. In particular, the study is concerned with the responsiveness of educational expenditures per pupil relative to increases in instructional expenditures per pupil in order to assess the effect of teacher salary increases on the overall growth of educational expenditures. A second part of the study is concerned with an examination of the impact on instructional expenditures per pupil of certain factors selected because of their potential effect on teachers' salaries.

In using the elasticity measure to express the relationship among changes in expenditure items, an interpretation of the coefficient slightly different from the more traditional one is necessary. Basically, an elasticity coefficient is an expression of the percentage change

*A good may be designated as a "necessity" when the slope of its demand curve is independent of changes in per capita income and as a "luxury" when the slope of the curve indicates a responsiveness to changes in per capita income.

in the dependent variable with respect to a one per cent change in the independent variable under consideration. Thus, if educational expenditures per pupil rise by 20 per cent but instructional expenditures per pupil increase by 10 per cent, the elasticity coefficient will be 2. Such a coefficient suggests that educational expenditure per pupil is rising at twice the rate of instructional expenditure per pupil. In fact, any coefficient greater than one indicates that instructional expenditures will become a smaller proportion of the total educational budget.

Conversely, a coefficient less than 1 and greater than 0 indicates that instructional expenditures are increasing at a greater rate than the total educational budget. If the elasticity is exactly one then both instructional and educational expenditures are increasing in constant proportion to one another. Negative values of elasticity coefficients indicate an inverse relationship which may be interpreted in one of two ways depending upon trends in the variables under consideration.

II INTERPRETATION OF THE ELASTICITIES

On the basis of the annual elasticities presented in Table II it would appear that during the period 1974-77 educational expenditures per pupil were increasing at a rate equal to or slightly greater than instructional expenditures per pupil. However, the overall elasticities for the period 1971 (see Table III) suggests that for separate and secondary schools instructional expenditures per pupil did experience a slightly more rapid average increase than did educational expenditures per pupil. In the case of public schools, the average increase in both of these expenditure measures is almost proportional.

The fact that instructional expenditures are rising at a rate faster than overall educational expenditures should not come as a surprise. School boards, in their attempts to limit expenditures have tended to focus upon budgetary items other than expenditures for instruction. Consequently, careful attention has been given to restraining increases in areas such as maintenance, heating and lighting. In contrast, little has been done in limiting instructional expenditures, indeed if anything could be done.

In effect, budgets are fiscal statements of the educational policies of the day with respect to the nature; quality; and quantity of education. For the past decade, at least, educational policies in Ontario have pursued a goal of equality of educational opportunity. More recently the public has begun to demand that the alternative goal of efficiency be given recognition if not a predominant position in educational decision-making. Unfortunately, the pursuit of these two goals provides a fundamental dilemma for educators in that no educational policy can be designed to fulfill both goals adequately. In fact, the conditions desirable for attaining equality of educational opportunity are generally inconsistent with those necessary to achieve efficiency.

In view of the fact that the average elasticities suggest that instructional expenditures per pupil are rising at a faster rate than the total expenditures per pupil then the policy of equality of educational opportunity would appear to be still considered important. However, a review of the annual elasticities reveals that the elasticities of public and secondary schools are increasing while those of separate

schools are decreasing. These trends would suggest that in the case of public and secondary schools the concern over efficiencies is being recognized. In the case of the separate schools, it would appear that they were concerned about efficiency sometime prior to the other schools and can now relax their stand somewhat. However, if the estimates for 1977 form a trend for the future it will inevitably result in instructional expenditures per pupil increasing at a lower rate than educational expenditures per pupil.

While an attempt has been made to explain the growth rates of the two expenditure methods it is also important to assess the impact on instructional expenditures per pupil of the factors which have a bearing on teacher salaries. In Ontario, an individual teacher's salary is primarily determined by his or her position on the salary grid which takes into account formal education and years of teaching experience. Both of these factors are often used as indirect measures of the quality of the educational system. Since the province has been committed to a continual improvement in the quality of the educational system, then salary increments due to an upgrading of the teaching force through higher levels of formal education and higher levels of teaching experience can be interpreted as part of the cost to be borne for improved quality. Similarly, a reduction in the pupil teacher ratio (PTR) is also considered as a surrogate measure for the quality of education being offered. Although changes in the PTR do not have an effect on an individual's salary they do have a bearing on the total expenditure for salary. Thus, if the PTR is reduced it will result in an increased educational expenditure per pupil.

A further factor which can account for higher salary levels is an increase in price levels. Although rises in price levels are generally viewed in the context of inflationary pressures which are a characteristic of our economy they may also reflect the competitiveness of teacher salaries with respect to salary increases across the labour force. Regardless of the reason, increased price levels inevitably result in higher instructional expenditures per pupil.

To assess the actual relationship changes in each of these variables with changes in instructional expenditures per pupil, it is necessary to review the elasticity coefficients presented in Tables VII. Since the salary grid is based upon the two quality measures, years of teaching experience and academic qualifications, one might expect that changes in these two factors would be strongly related with changes in per pupil instructional expenditures. In fact, the expenditure measure is not particularly responsive to either of these measures which suggests that changes in either years of teaching experience or academic qualifications have contributed very little to the increase in educational expenditures for the time period under consideration. With declining enrolments during this period, one might have expected that the level of academic qualifications and years of teaching experience would have increased significantly. It is evident from the provincial averages presented in Table VI that this development did not occur. Consequently, one must look to other factors than the ones above to assess the growth of educational expenditures.

During a period of rapid inflation and apparent significant salary gains by teachers it would be reasonable to assume that instructional expenditures would be responsive to price changes as represented by beginning salaries would. Once more, the evidence is to the contrary with the exception of 1977. However, even in 1977 a one per cent increase in beginning salary would lead to no more than a 0.44 per cent increase in educational expenditures per pupil when other factors remain constant. One can only infer that beginning salaries have not risen at a commensurate rate with educational expenditures and therefore are not as great a contributor to rising costs as might be expected.

Of all the independent variables employed in this analysis, changes in pupil teacher ratio is the dominant one. This measure of quality does not result in increases in individual salary but an overall increase in the salary bill since any reduction in the PTR for a constant enrolment will require an increase in the complement of the staff. The impact of PTR is particularly noticeable in the case of secondary schools where the opportunity to increase course and program offerings is greatest. Furthermore, educational expenditures, particularly in public and secondary schools have become increasingly responsive to reductions in the PTR. These observations and comments are further reinforced by the average elasticities given in Table VIII. Over the time period 1974-77 the average elasticity for PTR indicates that educational expenditures per pupil for public and elementary schools would increase by at least 1.2 per cent in contrast to a 0.5 per cent increase for separate school for a one per cent decrease in the P.T.R.

On the basis of this analysis, one can conclude that price changes of teacher services as measured by beginning salaries and educational quality improvements through more experienced and better qualified teachers have not had the impact on per pupil expenditures that might be expected. If changes in the salary component have had any significant effect on expenditures then it is because of a constant decline in PTR. However, the above comments must be tempered by the following observations.

With the calculation of the elasticities of instructional expenditures values of R^2 were also determined. This particular variable is a measure of the variance in the instructional expenditures per pupil accounted for by the particular independent variables used in the analysis. The level of R^2 in most cases is quite low and on no occasion exceeds 64.38 per cent. These low values suggest that the particular independent variables selected which represent changes in quality and prices of teacher services are not the most significant contributors to increases in educational expenditures per pupil.

III EFFECT OF LEVELS OF PROVINCIAL SUPPORT

A further concern of this study is the effect of different levels of provincial financial support on the relationship previously examined. In an attempt to deal with this issue six school boards for each type of school which had the lowest equalized assessment per pupil and a similar number of boards with the highest equalized assessment per pupil were selected from the population of school boards used previously. This method of selection is based upon the fact that equalized assessment per pupil is a measure of the wealth of a community.

Thus, those school boards with high equalized assessments per pupil are considered to be wealthy and thereby require the least amount of financial assistance from the provincial government.

A brief examination of Table IV reveals that the responsiveness of educational expenditures per pupil with respect to changes in instructional expenditures per pupil fluctuated regardless of type of school or level of provincial support. For this reason it is more appropriate to base any comments on the average elasticities which dampen out such fluctuations. It would appear that, with the exception of public schools of the more wealthy boards, instructional and educational expenditures are increasingly proportionately. Thus, instructional expenditures per pupil are not absorbing a greater proportion of the overall budget in either the wealthy or poorer school boards.

When the responsiveness of instructional expenditures to changes in the salary related variables are reviewed some differences between the boards receiving different levels of provincial support is evident. It would appear from the elasticities exhibited in Table IX that the instructional expenditures per pupil of the poorer boards are more responsive to changes in the factors representing changes in educational quality, particularly years of teaching experience and academic qualifications. Perhaps, equally significant is that educational expenditures of both types of boards are responsive to changes in beginning salaries, in particular the more wealthy boards.

Some of these differences may be accounted for by the location of two types of boards within the province. The wealthier boards tend to be located within the major metropolitan areas of Southern

Ontario whereas most of the boards which receive greater financial assistance from the provincial government are found in northern Ontario. The attractiveness to teachers of major cities is obvious therefore one can expect to find the more qualified and experienced teachers in such locations. In contrast, the north is less attractive for many teachers and consequently a greater proportion of such teachers will be less experienced and qualified. The outcome of this demographic pattern for the study is that within the wealthier school systems the quality of education is primarily improved by reductions in the PTR. In the case of the less wealthy boards there is a greater need to improve the quality of education by all means possible. This explanation is reinforced by the average elasticities for 1974-77 found in Table X.

Educational expenditures for both types of boards are also responsive to changes in beginning salaries which is contrary to the general findings. However, there is no consistent pattern to these elasticities which may be accounted for by different conditions under which salary negotiations occurred. The average elasticities provided in Table X suggest that the expenditures of the wealthy boards over the period under study have been more responsive to changes in price levels due to inflation and attempts by teachers to improve their relative salary position. This is perhaps understandable since it is within the more densely populated metropolitan that teachers are more sensitive to salary differentials with similarly qualified individuals in other sectors of the world of work.

Very few comments have been made regarding differences among separate, public, and secondary schools. In fact, the major differences among the types of schools is in degree rather than direction. For

this reason it was felt that comparisons should be kept to a minimum.

III SALARIES OF TEACHERS AND OTHER OCCUPATIONS

Since teacher salaries do constitute a significant portion of the educational budget a certain amount of speculation has been undertaken regarding teacher salaries in comparison to earnings in other occupations. Part of the mandate of this study was to undertake such a comparison. However, the Commission of Declining School Enrolments in Ontario (CODE) requested Professor David Stager²⁵ to undertake a study in which this very issue was included. Rather than repeat essentially the same exercise it was felt that a review of Stager's relevant findings would serve essentially the same purpose.

The data in Table XI compare the median salaries of teachers with the average total income for all employees in Ontario. Immediately following World War II male teachers' salaries experienced a decline relative to the rest of the Ontario work force. In contrast, the relative salaries of female teachers in public schools increased slightly. Between 1948-49 and 1960-61 the teachers' relative salaries in all school systems continued to rise. This increase was followed by a six year period during which relative salaries, especially those of secondary school teachers experienced a decline. Unfortunately, data on teacher salaries for the period 1969-70 and 1971-72 is not available. However, subsequent data indicates that relative salaries had declined further.

TABLE XI

MEDIAN SALARIES OF SCHOOL TEACHERS AS PERCENTAGE
OF ALL EMPLOYEES AVERAGE INCOME, ONTARIO, 1945 TO 1975

Year ^b	All Employees Average Income ^a	Public		Separate		Secondary	
		Males	Females	Males	Females	Males	Females
1945-46	\$1805	97	65	58	51	145	107
1946-47	2165	90	65	60	48	128	103
1947-48	2346	94	71	64	50	120	107
1948-49	2610	89	70	64	49	123	104
1949-50	2708	94	73	66	51	125	109
1950-51	3064	"	"	"	"	"	"
1951-52	3031	"	"	"	"	"	"
1952-53	3207	98	79	69	56	137	122
1953-54	3273	101	81	72	58	139	124
1954-55	3373	103	83	71	59	140	124
1955-56	3534	"	"	"	"	"	"
1956-57	3716	107	87	69	61	143	127
1957-58	3883	109	88	73	63	151	135
1958-59	3996	114	92	77	67	161	144
1959-60	4160	114	94	77	70	171	154
1960-61	4290	114	94	81	73	170	153
1961-62	4398	111	94	82	75	166	148
1962-63	4509	109	93	82	77	160	143
1963-64	4723	106	91	82	76	153	137
1964-65	4935	107	90	82	71	151	133
1965-66	5236	106	91	85	79	149	130
1966-67	5528	104	88	88	79	144	123
1967-68	5945	121	102	106	96	158	136
1968-69	6568	118	95	"	"	"	"
1969-70	6804	"	"	"	"	"	"
1970-71	7592	Total Elementary ^c		"	"	"	"
1971-72	8233	Males	Females	"	"	"	"
1972-73	8930	118	96	"	"	"	"
1973-74	10,005	114	92	"	"	143	112
1974-75	12,284	108	87	"	"	133	112

^a average total income for All Employees (taxable returns only) from Taxation Statistics

^b Taxation data are for calendar year beginning at mid-point of school year

^c includes both public and separate school teachers

Source: Stayer²⁵

The overall impact of these movements is that the relative salary of secondary school teachers in 1975 was at the same level as in 1951 which was at the beginning of a period of prosperity for teachers. As far as elementary teachers are concerned they did not fare as badly. Public school teachers received the same relative salary they received in 1957-58, whereas the relative salary of separate school teachers was set back to only 1966-67.

It would appear from the above data that despite salary increases received by teachers in the last few years they have not been sufficient to maintain their position relative to all other employees in Ontario. If relative salaries were to return to the highest levels attained the impact on instructional expenditures per pupil would be significant.

CHAPTER VI

OUTLOOK FOR PUBLIC SCHOOL FINANCE

1. INTRODUCTION

Just as man's past acts condition what he will be able to do in the future, so past trends can be of help in forecasting the per pupil expenditures in public education. Unfortunately, forecasts of future expenditures based on the technique of extrapolation of past experience can never be wholly accurate since economic tools are not precise enough. This lack of accuracy does not invalidate the usefulness of such projections in revealing possible or probable patterns for the future of education. Making such projections is at best an extremely risky undertaking, particularly in school finance which is affected by numerous exogeneous variables. In fact, it is more than likely that the most carefully formulated estimates will fall wide of their mark since projections can only be considered as predictions within the narrow limits of the assumptions used. Nevertheless, the conditions which make the projections differ also make it a necessary part of sound fiscal planning. Therefore, the purpose of this chapter is to present a method, by which the elasticities derived in the previous chapter, may be employed for predicting future per pupil expenditures for education within the next ten years.

II ASSUMPTIONS

Although increases in educational expenditures per pupil are not expected to continue at the rate experienced in the recent past it cannot be assumed that the appropriate level in the quality

of educational services has been met. In fact, many professional educators would argue much has yet to be done to improve the full spectrum of educational services. Consequently, before proceeding with this analysis it is necessary to establish the assumptions under which the predictions are to be made. These premises are basically limited to changes in the measures of educational quality and price levels used in this study.

Extreme changes in the levels of teaching experience; academic qualifications; beginning salary; and pupil teacher ratio are not anticipated over the next decade. Both the concern of the government over educational expenditures and the fall in enrolments will contain any escalation in the growth rate of expenditures. It is therefore assumed that the improvements in the quality of educational services as measured by the above variables will continue but at a reduced rate. Furthermore, the increase in price levels will be restricted.

If predictions are to be made regarding the trend in educational expenditures then some quantitative statements should be attributed to the qualitative notions just expressed. Unfortunately, adequate data covering the future of such variables is not readily available and additional assumptions regarding the growth rates of the variables under consideration must be made. The figures presented in Table XII represent the projected average annual growth rate in percentage terms of these variables for the period 1978-88. An explanation of each of these growth rates is provided below.

The maximum number of years of teaching experience used for salary purposes by most school boards is twelve. In a period of declining enrolments when the input of inexperienced teachers is

TABLE XII
PROJECTED ANNUAL RATES OF CHANGE FOR THE YEARS
1978-88

Type of Board	AVERAGE ANNUAL RATES OF CHANGE			
	Teaching Experience %	Academic Qualifications %	Begin. Salary %	Pupil Teacher Ratio %
Separate	2.36	5.07	6	0.55
Public	1.45	4.47	6	0.19
Secondary	1.44	0.69	6	1.11

reduced one can expect the average years of teaching experience in the province to increase. However, since inexperienced teachers will still be admitted, though in reduced numbers, it is not possible for the average level of teaching experience to ever reach twelve. For purposes of this study it is assumed that in ten years time the level of teaching experience will have reached 10 years for all types of schools. The annual growth rate of this variable thus varies from 1.44 per cent for secondary schools to 2.36 per cent for separate schools.

In the case of academic qualifications, the highest possible value that may be reached on the scale employed in this study is seven. However, for reasons similar to the ones expressed above it is assumed that by the end of the next decade the average academic qualifications for elementary schools will be 5.5 and for secondary schools 6.5. The difference implies that the attempts to equalize qualifications of all teachers will not be accomplished completely within the next ten years. Thus the average annual improvement in academic qualifications for secondary schools is expected to be 0.69 per cent in contrast to 4.47 and 5.07 per cent for the public and separate schools respectively.

It is somewhat more difficult to estimate the future growth rate of beginning salaries in light of recent experiences in the past. However, the more current trends in salary agreements suggest that an annual change in beginning salary of 6 per cent may be expected in the future.

The anticipated changes in pupil teacher ratio are based upon the assumptions of a recent study on teacher demand conducted for the Commission on Declining Enrolments (Ontario). The researcher in this study assumed in his 'Most Likely Scenario' a pupil teacher ratio of 20.5 for elementary schools and 15.0 for secondary schools by 1986-87. Using these values the annual rate of decline of the pupil teacher ratio will range from 0.55 per cent to 1.11 per cent, depending on the type of school.

III FUTURE EXPENDITURES

Projections of per pupil instructional expenditures may be derived by the use of the elasticities derived in this study in conjunction with the rates of growth of the independent variables presented above. This approach, does not take into account any significant changes in provincial educational policies, such as eliminating Grade XIII, on future expenditure levels. Thus, the model in essence represents a gradual improvement in the present quality of public education and thereby the projections may be considered as representing the minimum needs for the future.

The technique by which patterns of instructional expenditures per pupil is derived involves the use of the elasticities of instructional expenditures for each type of school for the years 1974-77. This time period is selected to reduce the effect of cyclical fluctuations in these coefficients. To arrive at the annual rate of growth of instructional expenditures per pupil it is necessary to sum the absolute products of the elasticity coefficient and respective annual growth rate of the respective independent variables.

This calculation is readily represented as follows:

$$R_s = E_t \cdot T + E_q \cdot Q + E_b \cdot B + E_g \cdot G$$

where R_s is the annual growth rate of instructional expenditures per pupil, E_t is the appropriate teaching experience elasticity, T is the teaching experience growth rate, E_q is the academic qualification elasticity, Q is the annual growth rate of the variable, E_b is the beginning salary elasticity, B is the annual increase in the beginning salary, E_g is the pupil teacher ratio elasticity and G is the annual rate of decline of the pupil teacher ratio.

Table XIII presents the instructional expenditure per pupil pattern for the next ten years. The values in the table present, on an annual basis, the increase in per pupil educational expenditures with respect to changes in the quality of education and the price level of teaching services. The expenditure indices are based upon the initial year of a ten year period and therefore reflect patterns of change, not actual dollar expenditures. As a consequence, the approach used can be considered applicable to any level of expenditure in the first year.

This analysis would indicate that the increase in instructional expenditures per pupil due to improvements in educational quality or increases in the price level of teacher services is not expected to be as rapid as in previous eras. On the basis of the procedure outlined earlier the model suggests that separate schools could expect the highest average annual increase of instructional expenditures per pupil with a rate of 3.35 per cent. In contrast, the average annual increase of 2.12 per cent, secondary schools would

TABLE XIII

INDICES OF INSTRUCTIONAL EXPENDITURES PER PUPIL FOR A TEN YEAR PERIOD
BY TYPE OF SCHOOL, 1978

Year	Separate	Public	Secondary
1	100.00	100.00	100.00
2	103.35	102.65	102.12
3	106.81	105.37	104.28
4	110.39	108.16	106.50
5	114.09	111.03	108.75
6	117.91	113.97	111.06
7	121.86	116.99	113.41
8	125.94	120.09	115.82
9	130.16	123.27	118.27
10	134.52	126.54	120.78

have the lowest increase of instructional expenditures while the value for public schools is calculated to be 2.65 per cent. Using these values one can expect instructional expenditures per pupil to increase by 34.5 per cent for separate schools; 26.5 per cent for public schools and 20.8 per cent for secondary schools over the time period under consideration.

V IMPLICATIONS FOR INSTRUCTIONAL EXPENDITURES PER PUPIL

The most interesting outcome of the above exercise is that instructional expenditures per pupil are expected to increase by only one fifth to a third of the present level of such expenditures over the next ten years with respect to changes in the measures of educational quality and price levels employed. This projection is approximately half the actual increase in instructional expenditures per pupil experienced between 1974 and 1977.

To explain this reduction it must be remembered that the study is limited to an assessment of the responsiveness of instructional expenditures per pupil to changes in selected indicators of educational quality and price levels of teacher services. The past has been marked with a concerted effort on the part of the Ministry of Education and local schools to improve the quality of education with the result that the values of the factors such as years of teaching experience and academic qualifications are fast approaching the limits set by the present salary grid structure (see Table VI). In fact, the values of the elasticities employed suggest that since 1974, at least, the rate of increase in these independent variables has not had a significant impact on instruc-

tional expenditures per pupil. Moreover, as these variables approach the established limits then their impact on instructional expenditures will become increasingly limited.

Similarly the pupil teacher ratio has experienced a significant reduction in recent years. Consequently, one can only assume that a considerably less dramatic rate of reduction will ensue in the future. The impact of this change on instructional expenditures will be similar to that of the previously mentioned independent variables.

The value of partial elasticities derived through the use of linear multiple regression rely not only on the changes in the variables concerned but also on the relationship existing with the other independent variables. It would therefore appear that factors of educational quality account for a greater proportion of the variance in instructional expenditures per pupil than do changes in the price levels of teacher services. As a consequence, the responsiveness of instructional expenditures per pupil to changes in beginning salary is very slight. As a consequence, changes in beginning salaries have little impact on the projected instructional expenditures.

While per pupil instructional expenditures have increased by over 50 per cent within the past five years all of the change cannot be attributed to increases in average teacher salaries. In fact, the elasticities calculated in this study for the time period 1974-77 account for no more than 61 per cent of the variance in instructional expenditures per pupil (see Table VIII). Thus, it is

possible that the projections provided in this chapter underestimate the actual rate of increase in educational expenditures per pupil. However, the study does show that increases in such expenditures are not totally the consequence of increases in factors associated with teacher salaries.

CHAPTER VII

SUMMARY AND CONCLUSIONS

I INTRODUCTION

This study has been concerned with an analysis of the responsiveness of educational expenditures to changes in selected measures of educational quality and price level of teacher services. As a consequence, it has involved (1) an analysis of the effect of changes in instructional expenditures per pupil on the per pupil educational expenditures; (2) an analysis of the responsiveness of instructional expenditures per pupil to changes in years of teaching experience; academic qualifications; beginning salary and pupil teacher ratio, (3) the formulation of an analytical approach to examine the effect of factors of educational quality and price level of teacher services on per pupil instructional expenditures.

The basis for the empirical analysis of this study is the economic concept of elasticity which describes the association among inter-dependent variables. The elasticity coefficient produced indicates the relative change of one variable with the corresponding change of one or more associated variables. The elasticities were calculated by the use of stepwise multiple regression analysis by which the elasticity could be derived as follows:

$$e = \frac{\log X + \log A}{\log Y}$$

where X is the dependent variable, Y is the independent variable, and A represents the regression constant. The present chapter will summarize the major findings.

The major findings of the study are summarized under the following headings: (1) Educational Expenditures; (2) Instructional Expenditures; and (3) Implications for the Future.

Educational Expenditures

The major finding relative to this part of the study is the lack of a set of elasticities common to the three types of schools examined. A similar situation existed in the comparisons of elasticities for each type of school based upon the level of financial support provided by the provincial government.

Although the average elasticities derived for the period 1971-77 are less than unity a slight trend is observable within the annual elasticities. This trend is towards elasticities greater than unity. Implicit in this observation is that educational expenditures can be expected to rise at a rate faster than that for instructional expenditures. In other words, factors other than teacher salaries and instructional materials are proportionately more responsible for the increasing levels of educational expenditures per pupil. It is conceivable that such factors may play an increasingly important role in future educational expenditures.

As enrolments decline it is not possible to diminish certain costs by a commensurate rate. For example, although a school which is not fully utilized will contain empty rooms it does not follow that the unused rooms have no cost implications. Even if rooms are "moth-balled" there is a certain ongoing maintenance cost involved. Such expenditures contribute to total educational expenditures and

are included in the per pupil expenditures. Thus, certain elements in the non-instructional portion of educational expenditures per pupil are growing despite a diminution of educational service. The impact of these factors is reflected in the elasticities presented.

Instructional Expenditures

The instructional expenditure elasticities derived in this study are considered to reflect the responsiveness of instructional expenditures per pupil to changes in both quality of educational services and the price levels of teacher services. Although no consistent patterns of these elasticities are observed among the types of schools it is evident that the most significant variable is the reduction in the pupil teacher ratio. In fact, the other variables seem to have an intermittent effect and very little impact on instructional expenditures per pupil.

The situation is somewhat different in the case of school systems receiving either a high or low level of provincial support. In the case of schools eligible for higher financial assistance from the province it would appear that instructional expenditures per pupil are particularly responsive to changes in changes in years of teaching experience and academic qualifications as well as the pupil teacher ratio. With the more wealthy school systems changes in beginning salary and pupil teacher ratio seem to have the greatest effect of instructional expenditures per pupil.

On the basis of the average elasticities for each type of school system it would appear that changes in the variables selected

to represent educational quality and the price level for teacher services do not correspond with an equivalent rate of change in educational expenditures per pupil. The exception to this comment is the elasticity coefficients associated with changes in the pupil teacher ratios.

This outcome should not be too surprising. For many years the Ministry of Education and individual school boards have been committed to two complementary goals, namely: Improving the quality of educational services and attaining equality of educational opportunity. In pursuit of these goals, teachers were encouraged to improve their formal education and significant efforts have been made to reduce pupil teacher ratios. At the same time, the average teaching experience has also increased.

As the limits of these factors are reached, particularly teaching experience and academic qualifications which form the basis of the salary grid, one would expect that impact on instructional expenditures to be reduced because of the search for other ways to improve the quality of education. It would appear that the elasticities reflect this trend in the case of teaching experience and academic qualifications. However, it is interesting to note that instructional expenditures per pupil are especially sensitive to changes in pupil teacher ratios. Because of these cost implications it is important that attempts continue in the search for a better understanding in the relationship between pupil teacher ratio and quality of education.

Despite the concerns expressed regarding the rising price levels of teacher services the elasticities of beginning salaries suggest that instructional expenditures per pupil are not especially responsive

to this factor. Part of the explanation of this observation may be found in the increases in teacher salaries relative to all employees in Ontario. Although the data provided in the study indicate that teachers relative salaries have improved since World War II a gradual decline of relative salaries has occurred in the seventies.

Implications for the Future

In the past educators have not always felt the need to be as equally concerned with costs as they have been with improving the quality of education. As enrolments decline and educational expenditures continue to rise educators are having to recognize the fiscal implications of educational changes. The method presented earlier in this study by which elasticities may be employed to predict future costs is one way of dealing with this matter.

The application of the method to assess the future impact of changes in educational quality and price levels of teacher services on instructional expenditures per pupil is of particular interest. On the assumption that no radical changes will occur in the independent variables employed it would appear that these variables have a limited impact on the increase of instructional expenditures per pupil. In fact, it is projected that the increase in such expenditures over the ten year period accounted for by changes in educational quality and price levels of teacher service will be no more than 34.5 per cent.

These predictions are based upon changes at the classroom level. In recent years, a trend has developed in education whereby a wider range of support services are provided to assist the classroom teacher. It is possible that the growth of instructional expenditures will be more greatly affected by changes in these services which have obvious educational quality implications.

The intent of this study has not been to provide answers to the issue of rising costs but to examine the contribution of certain factors to this trend. The factors selected were those that have been traditionally considered as the ones primarily responsible for rising instructional expenditures per pupil. The study shows that instructional expenditures are responsive to changes in the proxy measures of educational quality and price levels of teacher services. However, these measures will not account for the total increase in instructional expenditures per pupil. Moreover, the trend in elasticities of educational expenditures per pupil suggests that factors other than instructional expenditures per pupil will contribute increasingly to the rising expenditures.

BIBLIOGRAPHY

1. Thomas, R.A.L. Ministry of Education Memorandum, 1976-77:19
2. Simon, Larry G. "The School Finance Decisions: Collective Bargaining and Future Finance Systems" The Yale Law Journal, Vol.82, No. 3, January, 1973
3. Statistics Canada Financial Statistics 1971-72 to 1973-74, Ottawa: 1976 p. 74
4. Atherton, P.J., Hanson E.J., Berlando, J.F., Quality Education: What Price? Edmonton: Alberta Teachers' Association, 1969, p.4-8
5. Lielbenstein, H., Economic Theory and Organizational Analysis, New York: Harper and Row, 1960 p. 51
6. Brennan, M.J. Preface to Econometrics, Cincinnati: South-Western Publishing Co. 1965, p.80
7. Fabricant, S. The Trend of Government Activity in the United States Since 1900, New York: National Bureau of Economic Research, 1952.
8. Brazer, H.E. City Expenditures in the United States, New York: National Bureau of Economic Research, 1959
9. Hirsch, W.A. "Determinants of Public Education Expenditures" National Tax Journal 13(1960), pp. 29-40
10. McLoone, E.P. "Effects of Tax Elasticities on the Financial Support of Education", Unpublished Doctor's Dissertation, University of Illinois, 1961
11. James, H.T. School Revenue Systems in Five States, Stanford: School of Education, Stanford University 1961
12. Miner, J. Social and Economic Factors in Spending for Public Education, Syracuse: Syracuse University Press, 1963

13. Shapiro, S. "An Analysis of the Determinants of Current Public and Societal Expenditures per Pupil in Elementary and Secondary Schools", Unpublished Doctor's Dissertation, University of Chicago, 1962
14. Paterson, I.W. "An Analysis of the Determinants of Educational Expenditures among the Provinces of Canada, Decennially 1941-1961. Unpublished Doctor's Dissertation, University of Alberta, 1967
15. Atherton, P.J. "Income Elasticity - A New Way to Look at Demand for Education" School Administration February, 1968, pp. 28-32
16. Atherton, P.J. "The Impact of Rising Price Levels on Expenditures for School Operation in Alberta, 1957-65" Unpublished Doctor's Dissertation, University of Alberta, 1968
17. Sharples, B. "Educational Support and Economic Growth, 1930-66" Unpublished Doctor's Dissertation, University of Alberta, 1971
18. Hellriegel, D., French, W. and Peterson, R. "Collective Negotiations and Teachers: A Behavioral Analysis", Industrial Labor Relations Review, Apr. 1970, 23, 380-96
19. Kasper, H. "The Impact of Collective Bargaining on Public School Teachers", Industrial Labor Relations Review, Oct. 1970, 23, 57-72
20. Thornton, R.S., "The Effects of Collective Bargaining on Relative Teacher's Salaries", Conf. Southern Economic Assoc., Nov. 1970
21. Schmenner, Roger W. "The Determination of Municipal Employee Wages" The Review of Economics and Statistics, 1973
22. Landon, John H. and Baird, Robert N. "Monopsony in the Market for Public School Teachers" The American Economic Review 1971, 61, pp. 966-71

23. Burkhead, J. State and Local Taxes for Public Education,
Syracuse: Syracuse University Press, 1963, p. 50
24. Bird, R. The Growth of Government Spending in Canada, Toronto:
Canadian Tax Federation, 1970 p. 70
25. Stager, David, Elementary and Secondary School Teachers' Salaries
in Ontario, 1900 to 1975 Working Paper No. 5. Toronto: Commission
on Declining Enrolments in Ontario, 1978